

MATERIAL SAFETY DATA SHEET

1. SUBSTANCE AND SOURCE IDENTIFICATION

National Institute of Standards and Technology
Standard Reference Materials Program
100 Bureau Drive, Stop 2320
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SRM Number: 3111a
MSDS Number: 3111a
SRM Name: Cesium Standard Solution

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Description: This Standard Reference Material (SRM) is intended for use as a primary calibration standard for the quantitative determination of cesium. One unit of SRM 3111a consists of 50 mL of a single element solution in a high density polyethylene bottle sealed in an aluminized bag. The solution is prepared gravimetrically to contain a known mass fraction of cesium. The solution contains nitric acid at a volume fraction of approximately 1 %.

Material Name: Cesium Standard Solution

Other Designations:

Cesium: Cs; elemental Cesium.

Cesium Nitrate: CsNO₃, Cesium nitrate.

Nitric Acid: Aqua fortis; hydronitrate; azotic acid; engraver's acid.

2. COMPOSITION AND INFORMATION ON HAZARDOUS INGREDIENTS

Component	CAS Registry	EC Number (EINECS)	Concentration (%)
Nitric Acid	7697-37-2	231-714-2	1
Cesium Nitrate	7789-18-6	232-146-8	1.47
Cesium	7440-46-2	231-155-4	1

EC Classification, R/S Phrases: Refer to Section 15, Regulatory Information.

3. HAZARDS IDENTIFICATION

NFPA Ratings (Scale 0-4): Health = 4 Fire = 0 Reactivity = 2

Major Health Hazards: Nitric acid can cause severe or fatal burns if inhaled, swallowed, or absorbed through the skin.

Physical Hazards: Container may rupture.

Potential Health Effects

Inhalation:	Nitric acid can damage the mucous membranes and respiratory tract, causing spasm, inflammation of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Symptoms may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting. Teeth may also be damaged. Inhalation of cesium or cesium nitrate may irritate the respiratory tract; high-level exposure may cause chemical pneumonia. See also Ingestion.
Skin Contact:	Nitric acid can cause severe skin burns. Effects of acid burns may be delayed. Skin contact with cesium or cesium nitrate may cause irritation.
Eye Contact:	Nitric acid can cause severe eye irritation, corneal burns, permanent eye damage, or blindness. Cesium or cesium nitrate may cause eye irritation.
Ingestion:	Nitric acid can cause severe burns and damage to the GI tract. Cesium or cesium nitrate may cause liver damage.

Medical Conditions Aggravated by Exposure: None documented for this mixture. Its components may aggravate disorders of the eyes, skin, respiratory tract, kidneys, nervous system, cardiovascular system, and/or blood.

Listed as a Carcinogen/ Potential Carcinogen:

	Yes	No
In the National Toxicology Program (NTP) Report on Carcinogens	_____	<u> X </u>
In the International Agency for Research on Cancer (IARC) Monographs	_____	<u> X </u>
By the Occupational Safety and Health Administration (OSHA)	_____	<u> X </u>

4. FIRST AID MEASURES

Inhalation: Move the person to fresh air immediately. If not breathing, qualified personnel may start CPR or give oxygen if necessary. Get medical aid at once, and bring the container or label.

Skin Contact: Remove contaminated clothing and shoes. Flush affected skin with water for at least 15 minutes, then wash thoroughly with soap and water. If burns are severe or if skin irritation persists, get medical aid and bring the container or label. Wash contaminated clothing before reusing.

Eye Contact: Remove contact lenses (if any). Do not allow victim to rub eyes or keep eyes closed. Flush eyes with large amounts of running water for at least 30 minutes, keeping eyelids open and raising lids to remove all chemical. Get medical aid at once, and bring the container or label.

Ingestion: Contact a poison control center immediately for instructions. Wash out mouth with water, but do not induce vomiting. Get medical aid at once, and bring the container or label.

Note to Physician (Nitric Acid): For inhalation, consider oxygen. Avoid gastric lavage or emesis.

5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Negligible fire and explosion hazard. Nitric acid and cesium nitrate are both oxidizing agents that can react with combustible materials to cause fires. No data are available for the mixture, and its behavior may differ from that of the individual components.

Extinguishing Media: Use extinguishing media appropriate to the surrounding fire: water, dry chemical, carbon dioxide, or foam.

Fire Fighting: Avoid inhalation of material or combustion byproducts. Wear full protective clothing and NIOSH-approved self-contained breathing apparatus (SCBA).

Flash Point (°C): N/A

Autoignition (°C): N/A

Lower Explosive Limit (LEL): N/A

Upper Explosive Limit (UEL): N/A

Flammability Class (OSHA): N/A

6. ACCIDENTAL RELEASE MEASURES

Occupational Release: Do not touch spilled material. Absorb with sand or other non-combustible material. Notify safety personnel of spills. Collect spilled material in appropriate container for proper disposal.

Disposal: Refer to Section 13, Disposal Considerations.

7. HANDLING AND STORAGE

Storage: Store and handle in accordance with all current regulations and standards. Protect from physical damage, water, humidity, heat, direct sunlight, and incompatible materials.

Safe Handling Precautions: Wear chemical resistant clothing, gloves and chemical safety goggles (Section 8). Engineering controls should maintain airborne concentrations below TLV (Section 8).

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Nitric Acid:

ACGIH TLV-TWA: 2 ppm or 5 mg/m³

OSHA TLV-TWA: 2 ppm or 5 mg/m³

UK WEL: 5.2 mg/m³

Cesium Nitrate: No occupational exposure limits established.

Cesium: No occupational exposure limits established.

Ventilation: Use local or general exhaust to keep employee exposures below limits. Local exhaust ventilation is preferred because it can control contaminant emissions at the source, preventing dispersion into the general work area. Refer to the ACGIH document *Industrial Ventilation, a Manual of Recommended Practices*.

Respirator: If necessary, refer to the NIOSH document *Guide to the Selection and Use of Particulate Respirators Certified under 42 CFR 84* for selection and use of respirators certified by NIOSH.

Eye Protection: Use chemical safety goggles where dusting or splashing of solutions may occur. See OSHA standard (29 CFR 1910.133) or European Standard EN166. The employer should provide an emergency eye wash fountain and safety shower in the immediate work area.

Personal Protection: Wear appropriate gloves and protective clothing to prevent contact with skin.

9. PHYSICAL AND CHEMICAL PROPERTIES

Nitric Acid	Cesium Nitrate	Cesium
Appearance and Odor: Colorless to slightly yellow liquid, darkens to brown upon aging and exposure to light; irritating, pungent odor.	Appearance and Odor: odorless crystalline powder	Appearance and Odor: white to gray or white color, no odor
Relative Molecular Mass: 63.02	Relative Molecular Mass: 194.9	Relative Molecular Mass: 132.9
Molecular Formula: HNO ₃	Molecular Formula: CsNO ₃	Molecular Formula: Cs
Density (g/cm³): 1.05 (10%)	Density (g/cm³): 3.7	Density (g/cm³): 1.87
Solvent Solubility: decomposes in alcohol	Solvent Solubility: soluble in acetone; slightly soluble in alcohol.	Solvent Solubility: soluble in acids, liquid ammonia, and alcohol
Water Solubility: soluble	Water Solubility: 9.2 % (0 °C)	Water Solubility: reacts violently
Boiling Point (°C): 100 (212 °F)	Boiling Point (°C): decomposes	Boiling Point (°C): 705

NOTE: The physical and chemical data provided are for the pure components. Physical and chemical data for this solution do not exist. The actual behavior of the solution may differ from the individual components.

10. STABILITY AND REACTIVITY

Stability: X Stable Unstable

Stable at normal temperatures and pressure

Conditions to Avoid: Avoid heat, flames, sparks, and other sources of ignition. Avoid contact with incompatible and combustible materials.

Incompatible Materials: Acids, halogens, combustible materials, oxidizing materials, metals, bases, metal salts, metal oxides, reducing agents, cyanides, and peroxides.

Fire/Explosion Information: See Section 5.

Hazardous Decomposition: Thermal decomposition of this material may produce nitrogen oxides.

Hazardous Polymerization: Will Occur X Will Not Occur

11. TOXICOLOGICAL INFORMATION

Route of Entry: X Inhalation X Skin X Ingestion

Nitric Acid:

Human, oral: LD_{Lo} = 430 mg/kg

Rat, inhalation: LC₅₀ (4 hrs) = 130 mg/m³

Cesium Nitrate:

Rat, oral: LD₅₀ = 2390 mg/kg

Rat, intraperitoneal: LD₅₀ = 1150 mg/kg

Cesium:

Mouse, intraperitoneal: LD₅₀ = 1700 mg/kg

Target Organ(s): Skin, eyes, respiratory tract, GI tract, central nervous system, blood, kidneys, liver, heart.

Mutagen/Teratogen: Nitric acid has caused birth defects in animals under experimental conditions, and has also been investigated as a possible mutagen.

Health Effects: See Section 3.

12. ECOLOGICAL INFORMATION

Ecotoxicity Data

Nitric Acid: Rainbow trout: LC_{50} (96 hrs) = 2.8 µg/L

Environmental Summary: The ecological effects of this mixture have not been fully evaluated. Do not release to the environment.

13. DISPOSAL CONSIDERATIONS

Waste Disposal: Dispose of container and unused contents in accordance with federal, state, and local requirements for acid waste, which vary according to location.

14. TRANSPORTATION INFORMATION

U.S. DOT and IATA: Nitric Acid Solution, Hazard Class 8, UN2031, Packing Group II

15. REGULATORY INFORMATION

U.S. REGULATIONS

CERCLA Sections 102a/103 (40 CFR 302.4):

Nitric Acid: RQ = 1000 lb.
Cesium Nitrate: Not regulated
Cesium: Not regulated

SARA Title III Section 302: Nitric acid is regulated

SARA Title III Section 304: Nitric acid is regulated

SARA Title III Section 313: Nitric acid is regulated.

OSHA Process Safety (29 CFR 1910.119): Not regulated.

SARA Title III Sections 311/312 Hazardous Categories (40 CFR 370.21):

ACUTE:	Yes
CHRONIC:	Yes
FIRE:	No
REACTIVE:	Yes
SUDDEN RELEASE:	No

STATE REGULATIONS

California Proposition 65: No components are regulated.

CANADIAN REGULATIONS

WHMIS Classification:

Nitric Acid: C (oxidizing material), E (corrosive material)

WHMIS Ingredient Disclosure List: Nitric acid is regulated (1%)

EUROPEAN REGULATIONS

EU/EC Classification:

Nitric Acid: O (Oxidizer), C (Corrosive)

Cesium Nitrate: Not determined for the identified solution.

Cesium: Not determined for the identified solution.

Risk Phrases (mixture):

R23 (toxic by inhalation)

R25 (toxic if swallowed)

R34 (causes burns)

R36/37/38 (irritating to eyes, respiratory system and skin)

Safety Phrases (mixture):

S20/21 (when using, do not eat, drink or smoke)

S28 (wash after contact with skin)

S45 (in case of accident or illness, see doctor; show label)

S60 (dispose of this material and its container as hazardous waste)

NATIONAL INVENTORY STATUS

U.S. Inventory (TSCA): All components are listed.

TSCA 12(b), Export Notification: No components are listed.

16. OTHER INFORMATION

Sources: MDL Information Systems, Inc., MSDS *Cesium*, 16 June 2005.
MDL Information Systems, Inc. MSDS *Cesium Nitrate*, 16 June 2005.
MDL Information Systems, Inc. MSDS *Nitric Acid Solutions*, 16 March 2006.

Disclaimer: Physical and chemical data contained in this MSDS are provided only for use as a guide in assessing the hazardous nature of the material. The MSDS was prepared carefully, using current references; however, NIST does not certify the data in the MSDS. The certified values for this material are given in the NIST Certificate of Analysis.